

"Moving Straight Ahead"

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p.34 Problem #5

- a. To find out if the relationship between # of people & cost is to determine if the x & y values change in a constant way.

Rollaway Skates

X # of People	Y Cost
0	0
1	5
2	10
3	15
4	20
5	25
6	30
7	35
8	40

of people increases by 1 each time.
 cost increases by 5 each time x ↑ by 1.

Wheelie's Skates & Stuff

X # of People	Y Cost
0	100
1	103
2	106
3	109
4	112
5	115
6	118
7	121
8	124

of people ↑ by 1 each time.
 cost ↑ by 3 each time x ↑ by 1.

answer: From each table you can see that both companies have a constant increase in cost as the # of people increases. This means that the relationship between the # of people & cost is linear.

b. Rollaway Skates

Find slope = $\frac{\Delta y}{\Delta x} = \frac{+5}{+1}$ } I got this by looking @ the table above.
 slope = 5

Find y-intercept "b":

The y-intercept is the value of y when x is equal to zero. } also same.

Looking @ the table above you can see that the y-intercept for Rollaway Skates is zero.

Final Equation: $y = 5x + 0$
 $y = 5x$

Wheelie's Skates & Stuff

Find slope = $\frac{\Delta y}{\Delta x} = \frac{+3}{+1}$ } I got this by looking @ the table above.
 slope = 3

Find y-intercept "b"

When x is = to 0, y is = to 100.
 y-intercept is 100.

Final Equation: $y = 3x + 100$

(C.) The two plans would be equal ^{in cost} where their y values are the same on the data table.

- On a graph you would see where the cost is equal by where the two lines cross. The point where they intersect would give the cost & # of people at that point.
- a 3rd way to find out when the costs are the same you could set the two equations equal to each other, then solve for "x" this will tell you the # of people (x) when the cost (y) is equal.

Two equations: Rollaway States: $y = 5x$
 wheelie's States: $y = 3x + 100$

$$\begin{array}{r} 5x = 3x + 100 \\ -3x \quad -3x \\ \hline 2x = 100 \\ \hline x = 50 \end{array}$$

This means that @ 50 people the cost will be the same.

What is that cost? Rollaway: $y = 5x = 5(50) = 250$
 \$250
 wheelie's: $y = 3x + 100 = 3(50) + 100 = 250$

* This information helps the student council because below this # of people Rollaway is cheaper; above this # of people wheelie's is cheaper.

Below 50 people
 Rollaway: $y = 5(49) = 245$
 wheelie's: $y = 3(49) + 100 = 247$
 ↑
 49 people

Above 50 people
 Rollaway: $y = 5(51) = 255$
 wheelie's: $y = 3(51) + 100 = 253$
 ↑
 51 people

p. 35 Problem #7

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- just like in problem #5, a linear relationship can be shown when the change in y & change in x is constant.
- If it is constant change it is linear, not constant it is not.

a. x | y

-10	-29
0	1
10	31
20	61
30	91

+10 Δx, +30 Δy (repeated 4 times)

Linear!

b. x | y

1	9
5	17
7	21
20	47
21	49

+4 Δx, +8 Δy; +2 Δx, +4 Δy; +3 Δx, +26 Δy; +1 Δx, +2 Δy

Linear!

why? ...
because if the $\frac{\Delta y}{\Delta x}$ is the same each time it is linear.

$$\begin{aligned} \#1 \frac{\Delta y}{\Delta x} &= \frac{8}{4} = 2 \\ \#2 \frac{\Delta y}{\Delta x} &= \frac{4}{2} = 2 \\ \#3 \frac{\Delta y}{\Delta x} &= \frac{26}{13} = 2 \\ \#4 \frac{\Delta y}{\Delta x} &= \frac{2}{1} = 2 \end{aligned} \left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \begin{array}{l} \text{slope!} \\ \text{all the same!} \end{array}$$

c. x | y

1	17
2	43
3	97
4	167
5	257

+1 Δx, +26 Δy; +1 Δx, +44 Δy; +1 Δx, +94 Δy; +1 Δx, +170 Δy

Not Linear!

d. x | y

1	97
5	22
7	25
20	56
21	60

+4 Δx, +13 Δy; +2 Δx, +3 Δy; +13 Δx, +31 Δy; +1 Δx, +4 Δy

Not Linear!

why? $\frac{\Delta y}{\Delta x}$ is not the same each time

$$\begin{aligned} \#1 \frac{\Delta y}{\Delta x} &= \frac{13}{4} = 3\frac{1}{4} \\ \#2 \frac{\Delta y}{\Delta x} &= \frac{3}{2} = 1\frac{1}{2} \\ \#3 \frac{\Delta y}{\Delta x} &= \frac{31}{13} = 2\frac{5}{13} \\ \#4 \frac{\Delta y}{\Delta x} &= \frac{4}{1} = 4 \end{aligned} \left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \text{All different}$$

Equation for a:

Find slope: $\frac{\Delta y}{\Delta x} = \frac{30}{10} = 3$

y-intercept is 1 I know this from the data table.

$$y = 3x + 1$$

Equation for b:

Find slope: $\frac{\Delta y}{\Delta x} = 2$

Find y-intercept: use point (1, 9)

$$\begin{aligned} x: 1 & \quad y: 9 \\ m: 2 & \quad y = mx + b \\ & \quad 9 = 2(1) + b \end{aligned}$$

$$\begin{aligned} 9 &= 2 + b \\ 7 &= b \end{aligned} \quad y = 2x + 7$$

p.36 Problem #9

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● (a) Tom's Tunes

\$60 per hour

Total cost = \$60(hours)

$$y = 60x$$

Solidus' Sounds

\$100 plus \$40 per hour

Total Cost = \$40(hours) + \$100

$$y = 40x + 100$$

Light Plastic

\$175 plus \$30 an hour

Total cost = \$30(hours) + \$175

$$y = 30x + 175$$

(b) $y = 60x$

↓
This is the rate of cost per hour.

$$y = 40x + 100$$

↓
Rate of cost per hour.

$$y = 30x + 175$$

↓
Rate of cost per hour

(c) $y = 60x$

no y-intercept.
means there is no extra cost in addition to the hourly rate.

$$y = 40x + 100$$

This means \$100 extra in addition to the hourly rate.

$$y = 30x + 175$$

This means \$175 extra in addition to the hourly rate.

(d) in other words...
what is y when x is 8.5

$$y = 60x$$

$$y = 60(8.5)$$

$$y = \$510$$

in other words...
what is y when x is 8.5

$$y = 40x + 100$$

$$y = 40(8.5) + 100$$

$$y = 340 + 100$$

$$y = \$440$$

in other words...
what is y when x is 8.5

$$y = 30x + 175$$

$$y = 30(8.5) + 175$$

$$y = 255 + 175$$

$$y = \$430$$

(e) in other words...
what value of x will make y = to \$450

$$\frac{450}{60} = \frac{60x}{60}$$

$$x = 7.5 \text{ hrs.}$$

7 complete hours

same

$$\begin{array}{r} 450 = 40x + 100 \\ -100 \quad -100 \\ \hline 350 = 40x \\ \frac{350}{40} = \frac{40x}{40} \end{array}$$

$$x = 8.75 \text{ hrs.}$$

8 complete hours

same

$$\begin{array}{r} 450 = 30x + 175 \\ -175 \quad -175 \\ \hline 275 = 30x \end{array}$$

$$x = 9.166 \text{ hrs.}$$

9 complete hours

p. 37 Problem #10

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Skateboard costs \$270

Plan 1: Weekly payment \$10.80

Plan 2: \$120 payment then \$6 per week.
Take \$120 @ zero weeks.

a.

week	money left
0	\$270 - 3(\$10.80)
3	\$237.60 - 3(\$10.80)
6	\$205.20 - 3(\$10.80)
9	\$172.80 - 3(\$10.80)
12	\$140.40

Subtract \$32.40 for every 3 weeks.

After 12 weeks owe: \$140.40

week	money left
0	\$150 - 3(\$6)
3	\$132 - 3(\$6)
6	\$114 - 3(\$6)
9	\$96 - 3(\$6)
12	\$78

Subtract \$18 for every 3 weeks.

After 12 weeks owe: \$78

b. This is determined by figuring out how many weeks it takes to get to zero. Continue the chart.

12	\$140.40 - \$32.40
15	\$108 - \$32.40
18	\$75.60 - \$32.40
21	\$43.20 - \$32.40
24	\$10.80 - \$10.80
25	0

one week < 25

→ same

12	\$78 - \$18
15	\$60 - \$18
18	\$42 - \$18
21	\$24 - \$18
24	\$6 - \$6
25	0

Both pay off in 25 weeks

c. Plan 1

$$\text{Money left} = \$270 - \$10.80(\text{weeks})$$

$$y = \$270 - \$10.80(x)$$

Start money payer per week # of weeks

Plan 2

$$\text{money left} = \$270 - \$120 - \$6(\text{weeks})$$

$$y = \$270 - \$120 - \$6(x)$$

Start money onetime payment payer per week # of weeks

d. If skateboard cost \$355...

- would not change because the same amount would be paid off after 12 weeks.
- Plan 1 would be paid off more quickly due to higher payment/week.
- The start money amount would change but rest of equation would stay the same.

p. 38 Problem #16

To match an equation w/a graph the two pieces of helpful info. are the slope & the y-intercept.

For example:

slope: equation a. $y = 3x + 5$ slope: 3 y-int: 5

since slope is 3, this means that $\frac{\Delta y}{\Delta x} = \frac{+3}{+1}$ or $\frac{-3}{-1}$

This is helpful to know because this equation will match a line that either goes up 3 and to the right one or down three and to the left one.

y-int: The y-int is 5, which means that the line would cross at point $(0, 5)$.

★ So, I first look for a line that crosses the y-axis at $(0, 5)$, then I check to see if the slope matches.

When I do this I see that Graph 3 has 5 as a y-int. when I go up 3 and to the right one I hit the line again which means I have found my match.

equation a \rightarrow Graph 3

equation b: $y = x - 7$ slope 1, y-int. -7

I am looking for a line that crosses the y-axis @ -7 & goes up one and right one, or down one and left one.

Graph 4 matches these requirements.

equation b \rightarrow Graph 4

equation c: $y = -x - 10$ slope -1, y-int -10

Tebo's Tips: lines with negative slope slope "downward" from left to right.

Graph 2 matches these requirements.

equation c \rightarrow Graph 2

(d) Graph 1 - no match.

slope: $\frac{\Delta y}{\Delta x} = \frac{-4}{2} = -2$

y-int: 4

equation: $y = -2x + 4$

18. $y = -2x - 5$ Two examples: $x = \text{zero}$ $y = -2(0) - 5 = -5$
 $x = 1$ $y = -2(1) - 5 = -7$
19. $y = -5$ since the slope is zero y will be negative for any value of x .
20. $y = 2x - 5$ Two examples: $x = 0$ $y = +2(0) - 5 = -5$
 $x = 2$ $y = +2(2) - 5 = -1$
21. $y = \frac{3}{2}x - \frac{1}{4}$ Two examples: $x = 0$ $y = \frac{3}{2}(0) - \frac{1}{4} = -\frac{1}{4}$
 $x = -2$ $y = \frac{3}{2}(-2) - \frac{1}{4} = \frac{-6}{2} - \frac{1}{4} = -3\frac{1}{4}$

22. iii. because $y = 2x - 6$ has the same expression $2x - 6$ as the statement $8 = 2x - 6$.

23. $8 = 2x - 6$
 Since a point has a y coordinate & an x coordinate you can use one to find the other.

$\begin{cases} 8 \\ y \end{cases} = 2x - 6$ has the same form as ...
 $y = mx + b$

• since you are already given y you have this part done:

$(x, 8)$ to find x , solve the equation for x .

so the
 x value is
 7.

$$\begin{array}{r} 8 = 2x - 6 \\ +6 \quad \quad \quad \cancel{-6} \\ \hline 14 = 2x \\ \frac{14}{2} = \frac{2x}{2} \end{array}$$

$x = 7$

24. it is the graph that would be true if the x & y value were put into the equation. Point: $(7, -35)$

i. is not true because

$$\begin{array}{l} y = 2x \\ -35 = 2(7) \\ -35 \neq 14 \end{array}$$

ii. is True because

$$\begin{array}{l} y = -5x \\ -35 = -5(7) \\ -35 = -35 \end{array}$$

- (25) Since we know that point $(7, -35)$ is on a line with equation $y = -5x$ then...

$$\begin{array}{l|l} (-1.2, ?) & y = -5(-1.2) \\ \uparrow & y = +6 \\ \text{x-value} & \end{array} \quad \begin{array}{l|l} (?, -15) & y = -5x \\ -15 = -5x & \\ -5 & -5 \\ 3 = x & \end{array}$$

- (26) equations with positive slopes have a positive rate of change.
these equations are: i, iii.
- (27) equations with negative slopes have a negative rate of change.
these equations are: ii, iv.
- (28) equations with no slope have a rate of change of zero.
the equation is v.

p.41 Problem #32

Decide whether each statement is T or F.

a. $15 - 3x = 15 + \overset{\text{same}}{-3x}$
 $15 - 3x = 15 - 3x$
 True

b. $3.5x + 5 = 5(0.7x + 5)$
 $3.5x + 5 = 3.5x + 25$
 False

c. $3(2x+1) = (2x+1) + (2x+1) + (2x+1)$
 $6x+3 = 6x+3$
 True

p.42 Problem #35

Ms. Peggy paid \$15 for 20 bagels.

(a) money \div # of bagels = $\frac{\$15}{20 \text{ bagels}} = \frac{\$3}{4 \text{ bagels}} = \frac{\$0.75}{1 \text{ bagel}}$

(b) Total cost = $0.75(n)$
 $C = 0.75(n)$

c. $n = 150 \text{ bagels}$ $C = 0.75(150)$
 $C = \$112.50$

P.42 Problem #38

On day 3, 44 cups left in bag
on day 11, 28 cups left in bag.

Day	cups left
3	44
11	28

(a) if she feeds 16 cups in 8 days
She feeds $\frac{16 \text{ cups}}{8 \text{ days}}$ or $\frac{2 \text{ cups}}{1 \text{ day}}$

(b) To find out the cups in the beginning you have to go back to day zero.

- on day 3 there were 44 cups.
day 2 " " +2 \rightarrow 46 cups
day 1 " " +2 \rightarrow 48 cups
day 0 " " +2 \rightarrow 50 cups

(c) equation: Food Left = 50 cups - 2 (days)
 $F = 50 - 2(d)$

P.43 Problem #39

- Graph 1 \rightarrow constant slope = constant rate.
- Graph 3 \rightarrow slope increases throughout race means \uparrow in speed.
- Graph 2 \rightarrow Graph curves up then becomes flatter near top/end of race.
- Graph 5 \rightarrow Fast slope @ first then is horizontal/not moving @ end.
- Graph 4 \rightarrow no moving in beginning, constant rate @ end.

p.44 Problem #42

Change is the same.

Linear!

(a) $y = 2x$

x	y
0	0
1	2
2	4
3	6

An equation is linear if it has a constant change in y for every change in x. The easiest way to find out is to make a t-chart for the equation. Then see if the change is constant.

(b) $y = \frac{2}{x}$

x	y
0	undefined

This equation is not graphable because at zero x there is no value of y that will make it true.

(c) $y = x^2$

x	y
0	0
1	1
2	4
3	9

Not Linear
The change is not constant.

P. 65 Problem #38

Page 10

Phone company charges \$50/month plus \$0.10/minute

(a.) Total monthly cost = \$0.10(minutes) + \$50

$$C = 0.10(t) + 50 \leftarrow \text{simple form}$$

Remember that this is really in this form!

$$y = 0.10(x) + 50$$

(b.) How much \$ for $10\frac{1}{2}$ hours in a month?

- Convert hours to minutes $10.5 \text{ hours} \times \frac{60 \text{ minutes}}{1 \text{ hr}}$

- use the equation: $C = 0.10(630) + 50$ $= 630 \text{ minutes}$

$$C = 63 + 50$$

$$C = \$113$$

place the # of minutes into the equation.

(c.) How many minutes for \$75.

- use the equation: $C = 0.10(t) + 50$

put \$75 into the equation

$$\begin{aligned} 75 &= 0.10(t) + 50 \\ -50 & \\ \hline 25 &= 0.10(t) \\ \frac{25}{0.10} &= \frac{0.10(t)}{0.10} \end{aligned}$$

use inverse operations to solve the equation for "t".

$$t = 250 \text{ minutes}$$

p.66 Problem #41

Page 11

- Beyond 30, person's height can decrease by 0.06cm/yr.

(a) height after 30 = height at age 30 - 0.06cm (years after 30)

$$h = H - 0.06(t) \leftarrow \text{simple form}$$

(b) use the equation to calculate possible height for both 60 & 70 years old, this will give a good estimate.

$$h = H - 0.06(t)$$

$$h = H - 0.06(t)$$

@ age 60

@ age 70

$h = 160$ put #s
 $t = 30$ in

$$160 = H - 0.06(30)$$

$$160 = H - 1/8$$

$$+1.8 \quad +1.8$$

$$\boxed{161.8 = H}$$

$h = 160$ put #s
 $t = 40$ in

$$160 = H - 0.06(40)$$

$$160 = H - 2.4$$

$$+2.4 \quad +2.4$$

$$\boxed{162.4 = H}$$

↑
 because it is
 40 years after
 30 years old.

↑
 because it is
 30 years after
 30 years old.

Grand ma was between 161.8 cm and 162.4 cm

I used the equation.

(c) 6 feet 6 inch basketball player

convert to cm first: $6.5 \text{ ft} \times \frac{12 \text{ inches}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ inch}}$

Height @ age 30 is 198.12 cm

$$H = 198.12 \text{ cm}$$

$$t = 80 \text{ years} - 30 \text{ years} = 50 \text{ years}$$

use equation:

$$h = H - 0.06(t)$$

$$h = 198.12 \text{ cm} - 0.06(50)$$

$$h = 198.12 \text{ cm} - 3 \text{ cm}$$

$$h = 195.12 \text{ cm}$$

He would be about 195.12 cm

Page 79 Problem #3

Page 12

Equations:

When you put the point into the equations, both sides will be equal.

	i	ii	iii	iv	v	vi	vii
a. $y = 2x$	X		X	X			
b. $y = 3 - 3x$		X				X	
c. $y = 2x + 3$	X					X	
d. $y = 5x - 3$	X			X			X
e. $y = 2$				X	X	X	

Page 81 Problems #20 through #23

There is no I!

	A	B	C	D	E	F	G	H	I	J	K
20. + slope		X			X					X	
21. slope of -2	X					X					X
22. slope of 0			X	X			X	X			
23.		a.		b.	c.						

#20: Positive Slopes can be seen

- on a graph \rightarrow the line goes up from left to right.
- on a data table \rightarrow if you calculate $\frac{\Delta y}{\Delta x}$ the outcome is positive.
- on an equation the value of "m" is positive like letter J.

#21: A negative slope of 2 can be seen

- on a graph \rightarrow The line goes down from left to right because the slope is negative and the value of y goes down by 2 when the value of x goes one to the right.
- on a data table \rightarrow if you calculate $\frac{\Delta y}{\Delta x}$ the outcome is -2.
- on an equation the value of "m" is -2.

#22: A slope of zero can be seen

- on a graph when the line is horizontal, no change in slope.
- on a data table \rightarrow The values of y will not change. All be the same.
- on an equation, since the slope is zero the circled part is missing.

$$y = (mx) + b$$

James: works 2 days during weekdays/pays \$14.95/month ^{plus} \$0.50/minute

Shani: works 2 days during weekends/pays \$34/month

(a) James

Total Cost = \$0.50 (minutes) + \$14.95
per month
 $C = 0.5(t) + 14.95$

Shani

Total Cost = \$34
per month
 $C = 34$

(b) yes, it is possible for James to have a higher bill than Shani because he pays for every minute, but Shani does not. If he uses too many minutes he will pay more than Shani.

(c) Yes, they could pay the same amount.

- to find this you set the equations to each other, then solve for the # of minutes.

equations: $C = 0.5(t) + 14.95$ James
 $C = 34$ Shani

$$\begin{array}{r} 0.5t + 14.95 = 34 \\ -14.95 \quad -14.95 \\ \hline \end{array}$$

$$\begin{array}{r} 0.5t = 19.05 \\ \hline 0.5 \quad 0.5 \\ \hline \end{array}$$

$$t = 38.1 \text{ minutes}$$

(a) about 38 minutes
They will pay the same amount.

(d) Three equations:

James $A = 0.25n + 25$
 $C = 0.5t + 14.95$
Shani $C = 34$

→ The new equation has a higher fee than James but lower than Shani.

- The per minute rate is lower than James' current plan, but Shani did not pay a per minute fee to begin with.

- It depends on how many minutes are used.